COMMUNICATIONS

MAINTENANCE MANUAL

Portable TEST SET MODEL 4EX3A10

COMBINATION NUMBERS TM11, TM12 and TM13

CTEC CORPORATION CENTER

EX-3-A

SPECIFICATIONS *

Description	Portable meter for aligning and troubleshooting two-way radios which have centralized metering facilities. For servicing equipment without centralized metering, test set can be used as 20K ohm-per-volt voltmeter	
Meter used in test set	3-1/2" panel meter with jeweled pivot, off-center zero	
Sensitivity	-10 and +50 microamperes full scale. External resistance added to make useable sensitivity -0.2 and +1.0 volt full scale (20 kilohms per volt).	
Internal resistance	1370 ohms ±15%	
Damping factor	32 nominal	
Response time	1.4 seconds nominal	
Accuracy	±3% of full scale	
Overload protection	Meter movement protected by diodes	
Centralized metering functions	With test cable connected to transmitter	With test cable connected to receiver
Test selector	Selects 1 of 11 circuits to be metered	
Range selector	Selects 1-volt or 3-volt meter range	
Polarity switch	Reverses meter polarity	
High Sensitivity Switch	Provides a 100-millivolt full scale meter range	
DISCriminator	---	Reverts meter from test circuits "B" - "K" to measure discriminator
XMTR TEST	Keys transmitter	---
AUDIO jacks	For connecting audio signal generator to modulate xmtr	For connecting revr output to audio voltmeter or distortion analiyzer
MIKE jack	For keying or voice-modulating xmtr with mike or handset and monitoring rcvr with handset	For monitoring rcvr with handset
DC voltmeter functions	Using test probes	
Range selector	Selects 1, 3, 15, 30, 100, 300 or 1000-volt meter range (with test selector in "VM" position)	
Polarity switch	Reverses polarity of meter	
Operating temp range	0°C to +50°C (+32°F to +122°F)	
	Test Set	Optional Case
Size (L x W x H)	12.8" x 5.1" x 3.4"	13.5" x 6" x 6.2"
Weight	4.5 pounds	3.0 pounds

*These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

GENERAL ELECTRIC

TABLE OF CONTENTS

SPECIFICATIONS . . . . . Cover
DESCRIPTION. 1
OPERATION. 1
Centralized Metering. 1
DC Voltmeter Measurements 3
CIRCUIT ANALYSIS 3
DISASSEMBLY. 4
CALIBRATION PROCEDURE. 4
OUTLINE DIAGRAM. 6
SCHEMATIC DIAGRAM. 7
PARTS LIST 8
PRODUCTION CHANGES 8

ILLUSTRATIONS

Figure 1 - Calibration Setup 4

COMBINATION NUMBER INDEX

COMBINATION NUMBER		USED WITH
TM11	Includes: 4EX3A10 with 19A122432-G2 Cable and Test Probe Assembly.	PORTA-MOBIL, MASTR Progress Line Professional and Executive Series, and MASTR Mobile Telephone systems.
TM12	Includes: 4EX3A10 with 19A122432-G1 and G2 Cable and Test Probe Assemblies.	PORTA-MOBIL, MASTR Progress Line Professional and Exceutive Series, MASTR Mobile Telephone systems, and IMTS Mobile Telephone systems.
TM13	Includes: 4EX3A10 with 19A122432-G1 Cable and Test Probe Assembly.	IMTS Mobile Systems including Manual and Dial Models.

WARNING

No one should be permitted to handle any portion of the equipment that is supplied with high voltage; or to connect any external apparatus to the units while the units are supplied with power. KEEP AWAY FROM LIVE CIRCUITS.

DESCRIPTION

Test Set Model 4EX3A10 is designed to facilitate servicing General Electric Two-Way Radios. For equipment with centralized metering facilities, a Test Cable connects the Test Set to the transmitter or receiver being serviced. For equipment which does not employ centralized metering, the set may be used as a 20,000 ohm-per-volt DC voltmeter.

The off-center zero on the meter scale premits both positive and negative discriminator voltages to be measured, with changing polarity. At the same time it preserves maximum scale lengths, so that readings can be easily and accurately made.

The steel case of the Test Set has a carrying handle and four rubber feet, to protect surfaces on which it is laid. All controls are located on the front panel; test jacks (except for the test probe jacks) are located on the right end of the set.

CARRYING CASE (Optional)

A metal, two-section carrying case is available for storing and carrying the Test Set. The set slides into the front section of the case, where it is protected from shock by rubber pads. The test cable can be left connected to the meter, draped over the dividing partition, and stored in the rear section of the case with the test probes.

OPERATION

All controls on the Test Set are conveniently located on the front panel. The microphone jack and the AUDIO test jacks are located on the right end of the set beneath the 32-pin test cable jack.

NOTE

Before transporting the Test Set, always place the RANGE SELECTOR switch in the OFF position to damp the meter movement.

CENTRALIZED METERING

When servicing two-way radios with centralized metering jacks, connect the proper test cable from the Test Set to the metering jack on the transmitter or receiver. The TEST SELECTOR switch can then be used to select the circuit which is to be metered. A decal is normally provided near the centralized metering jacks to indicate which cirucits are metered with the TEST SELECTOR switch in positions "A" through "K". Alignment instructions for transmitters and receivers with centralized metering also indicate the metering positions to be used.

With the test cable connected to a MASTR transmitter and the TEST SELECTOR switch in position "G", the meter will measure PA plate current. By moving the RANGE SELECTOR from the "TEST 1" position to the "1000" (volt) position, however, PA plate voltage can be metered.

NOTE

Since many transmitters designed for centralized metering are adjusted for a PA PLATE loading of 0.7 volt (polition "G"), a red mark has been provided on the meter scale at this reading.

Range-Selector Switch

In TEST 1 position, this switch sets the meter range for 1 volt full scale; in TEST 3 position, it sets the range fo 3 volts. For centralized metering, this switch should normally be in the TEST 1 position.

Polarity-Reversing Switch

If the needle on the meter should deflect to the left end of the scale, this switch can be used to reverse the polarity of the meter and bring the reading on-scale. While metering PORTA-MOBIL and MASTR Executive equipment, it should normally be in the "+" position; for MASTR Professional equipment, it should normally be in the "-" position. It may be necessary to switch the polarity of the meter while checking F1L voltage, depending upon whether the radio is installed in a vehicle with a positive-ground or negative-ground battery.

High Sensitivity Switch

With the range selector switch in the 1-volt position, pressing the high sensitivity switch (S5) bypasses R1 (16.2K ohms) and R2 (2430 ohms) with potentiometer R6 (25-500 ohms) and R5 (390 ohms). The lower resistance in the meter input circuit permits a 100-millivolt full scale meter reading.

DISCriminator Switch

Pushing the DISC button instantly switches the meter from test positions "B" through "K" back to the discriminator circuit (position "A"). This feature eliminates the need for a second meter to monitor the discriminator voltage.

XMTR TEST Switch

While servicing transmitters, the transmitter can be easily keyed by pressing the XMTR TEST switch.

AUDIO Jacks

With the Test Set connected to a transmitter, the AUDIO test jacks provide a convenient place to connect an audio oscillator for modulating the transmitter. This facilitates setting transmitter modulation

levels. With the Test Set connected to a receiver, the receiver audio output can be measured across the AUDIO test jacks.* An audio voltmeter or distortion analyzer can be easily connected here for receiver quieting or SINAD measurements. Note that these jacks are properly spaced to accept a standard dual-banana plug.

Microphone Jack

The microphone jack on the end of the Test Set provides a convenient place to connect a microphone or handset for keying or voice-modulating a MASTR transmitter. The audio output of the receiver can also be monitored by a handset connected to this jack.

DC VOLTMETER MEASUREMENTS

To use the Test Set as a DC voltmeter, just place the TEST SELECTOR switch in the "VM" position. Use the RANGE SELECTOR switch to select the desired voltage range: 1, 3, 15, 30, 100, 300 or 1000 volts. Connect the test probes to the red and black jacks beneath the meter on the front of the Test Set.

With the polarity-reversing switch in the "+" position, the red test probe jack will be positive and the black jack will be negative. To quickly change the polarity of the test probes, just flip the switch to the "-" position.

CIRCUIT ANALYSIS

The voltage range desired is selected by RANGE SELECTOR switch S3, which connects meter M1 to TEST SELECTOR switch S2 through a series string of precision resistors (R3 through R8). S3 switches the positive and negative sides of the meter to eleven floating pins on S2, which selects the circuit to be metered.

Diodes CR1 and CR2 limit the meter overload to approximately six times the rated current of the meter, with less than 0.5% full-scale compression. As a 1-volt instrument, the meter is protected for a 1000 to 1 overload. However, under this condition, one or more of the metering resistors may be damaged.

CAUTION

Due to the lower resistance in the meter circuit, the meter is more susceptible to damage when using the high sensitivity (HS) switch. Always check the meter reading before pressing the high sensitivity switch.

*In PORTA-MOBIL receivers before Rev. A, the LO side of the receiver audio output will appear at the AUDIO HI jack on the Test Set and the HI side will appear at the AUDIO LO jack.

DISASSEMBLY

To service the Test Set, simply remove the four screws holding the rubber feet and lift off the back plate.

CALIBRATION PROCEDURE

If meter M1 is ever replaced, potentiometer R9 must be reset according to the following procedure.

1. Remove the back plate from the Test Set.
2. Place the Test Selector switch in the VM position, the Meter Sensitivity switch in the 1-volt position, and the Polarity switch in the "+" position.
3. Connect the three calibration resistors and a fresh 1 1/2-volt "D" cell as shown in Figure 1.

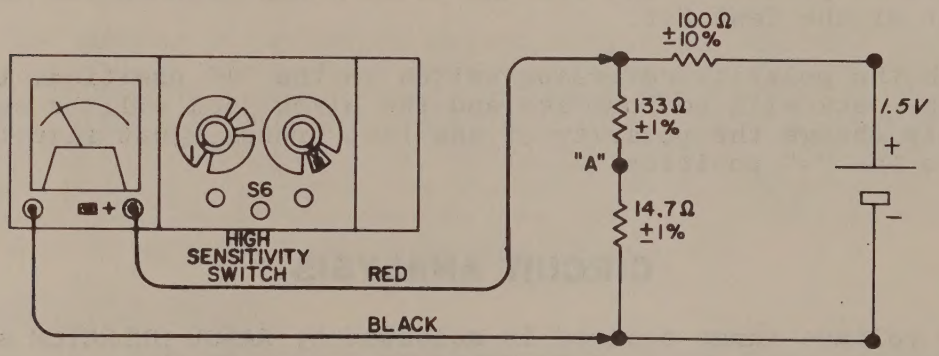
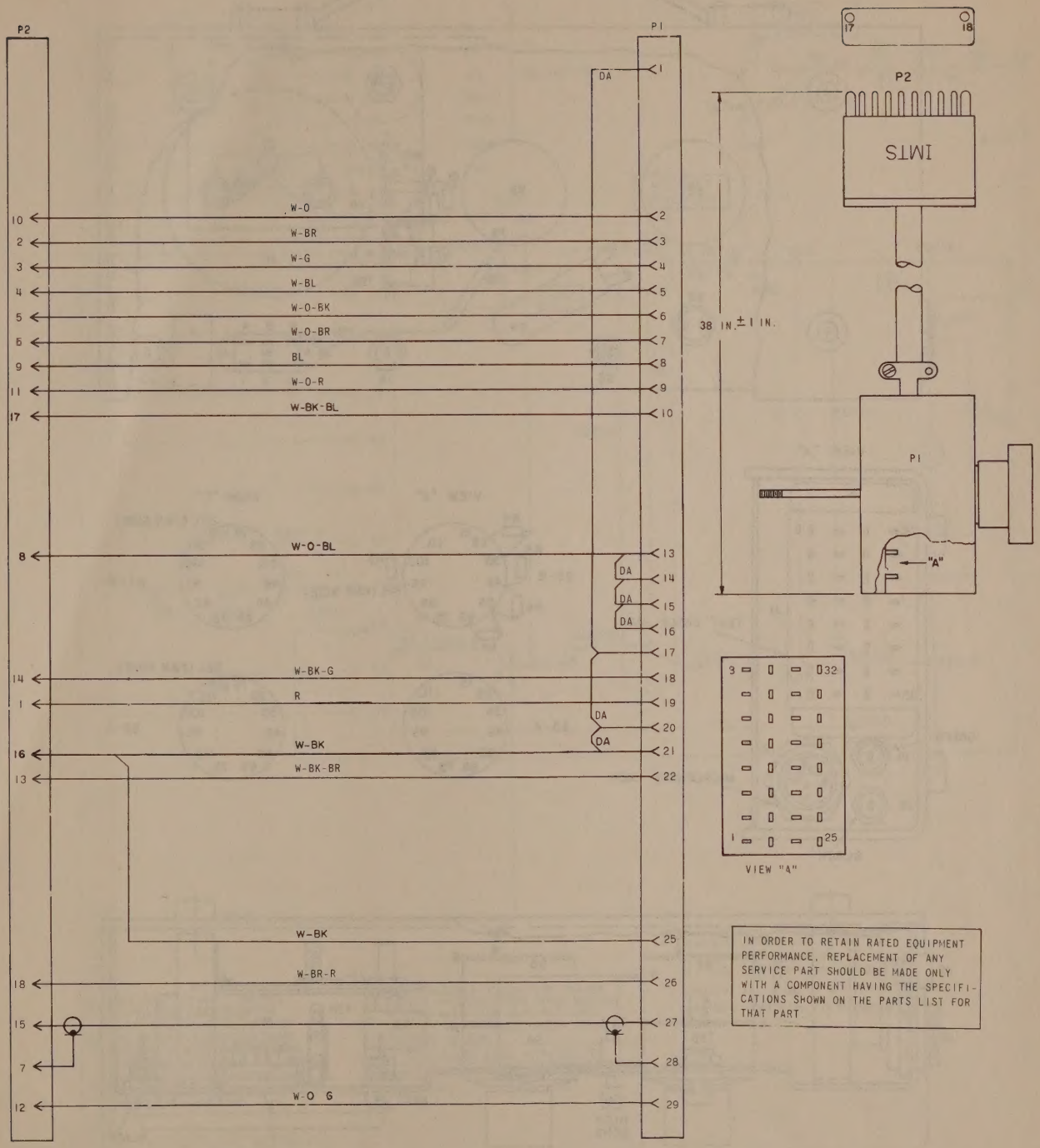


Figure 1 - Calibration Setup

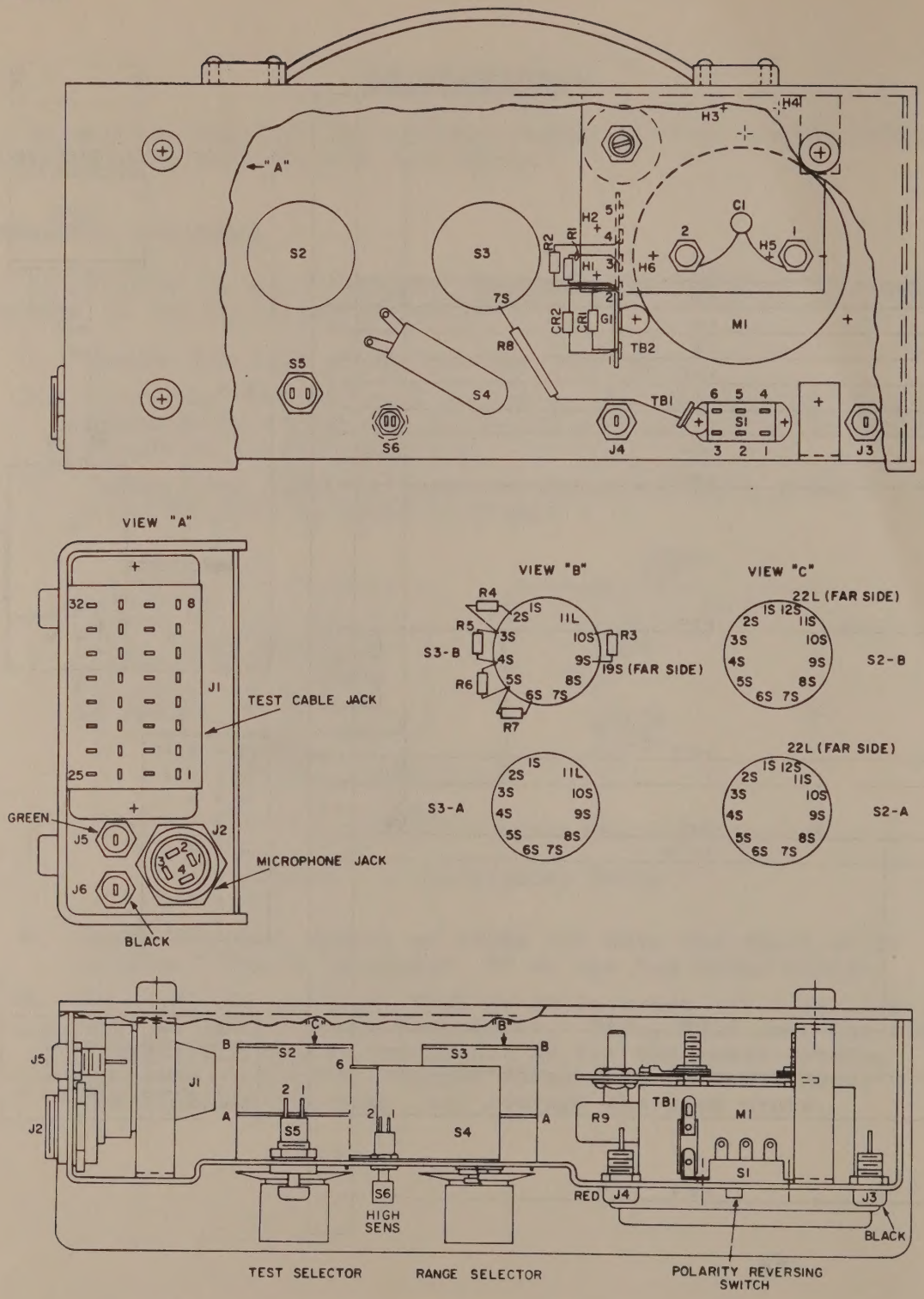
4. Apply the test probes as shown and note the exact meter reading (should be approx. 90 on the top meter scale).
5. Now move the positive test probe to point "A" (junction of 133-ohm and 14.7-ohm resistors). Then, hold down the HIGH SENSITIVITY switch and adjust R9 for the exact reading obtained in Step 4. Repeat Steps 4 and 5 until meter readings are the same, and replace the back plate.



W2

TEST CABLE 19D402466-G2 (for IMTS Mobile Systems)

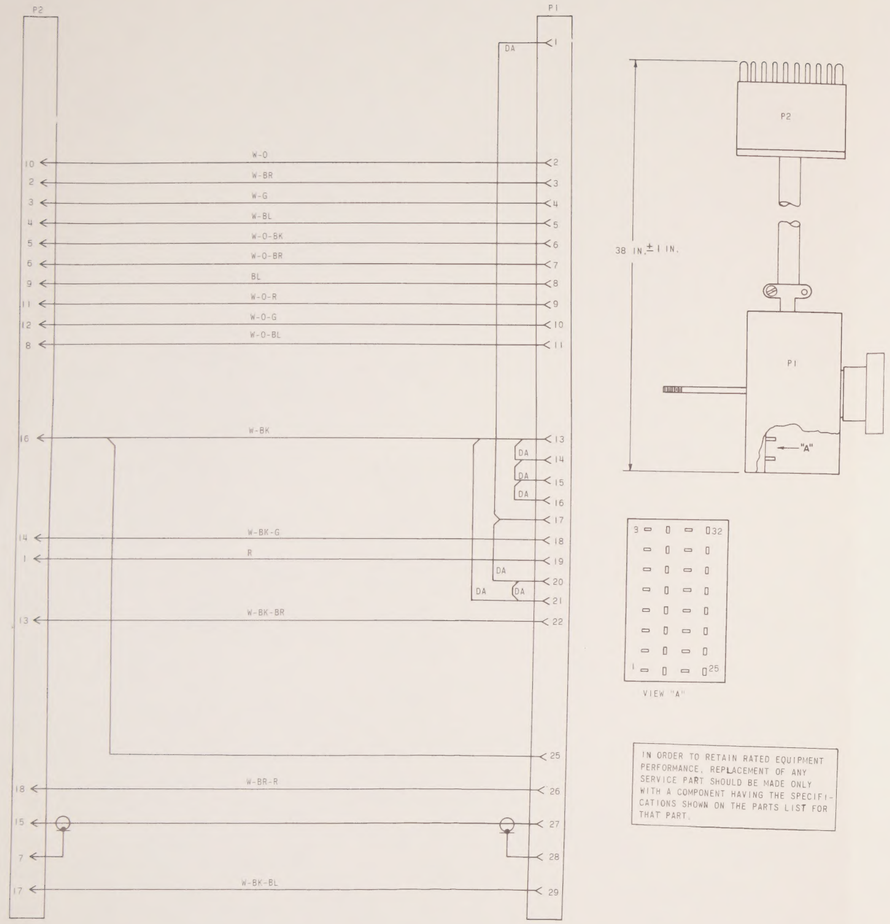
(19D402738, Rev. 1)



(19C303705, Rev. 3)

OUTLINE DIAGRAM ___

TEST SET MODEL 4EX3A10



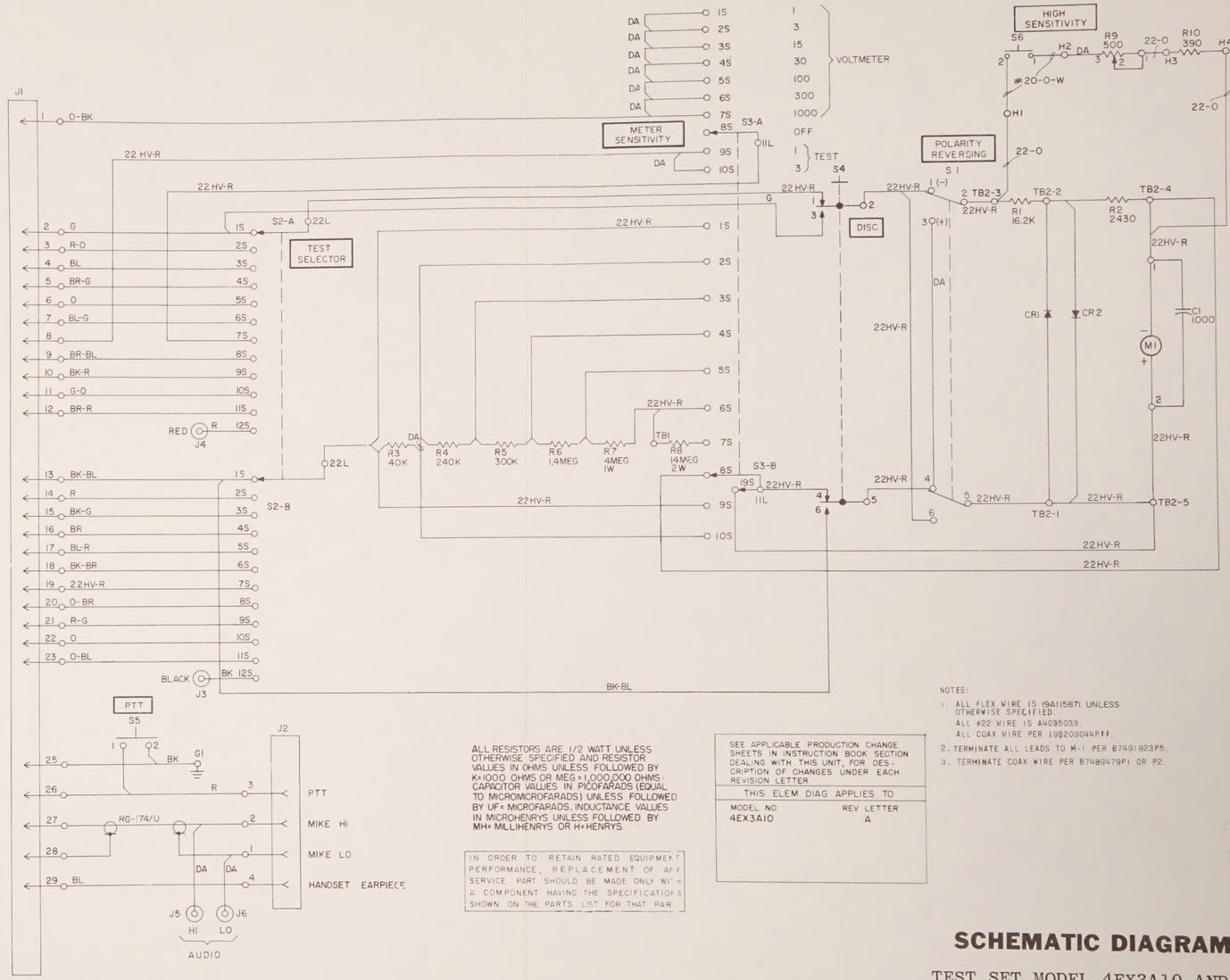
W1

VIEW "A"

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

TEST CABLE 19D402466-G1 (for PORTA-MOBIL, MASTR Progress Line Professional and Executive Series, and MASTR MTS)

(19D402466, Rev. 3)



ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS.

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN ON THE PARTS LIST FOR THAT PART.

SEE APPLICABLE PRODUCTION CHANGE SHEETS IN INSTRUCTION BOOK SECTION DEALING WITH THIS UNIT, FOR DESCRIPTION OF CHANGES UNDER EACH REVISION LETTER.

THIS ELEM DIAG APPLIES TO	
MODEL NO	REV LETTER
4EX3A10	A

NOTES:
1. ALL FLEX WIRE IS 19A115871 UNLESS OTHERWISE SPECIFIED.
   ALL #22 WIRE IS A4035033.
   ALL COAX WIRE PER 19B209044P11.
2. TERMINATE ALL LEADS TO M-1 PER B7491823P5.
3. TERMINATE COAX WIRE PER B7489479P1 OR P2.

SCHEMATIC DIAGRAM

TEST SET MODEL 4EX3A10 AND TEST CABLE 19D402466-G1

(19D402451, Rev. 4)

ORDERING SERVICE PARTS

Each component appearing on the schematic diagram is identified by a symbol number, to simplify locating it in the parts list. Each component is listed by symbol number, followed by its description and G-E Part No.

Service Parts may be obtained from Authorized G-E Communication Equipment service Stations or through any G-E Radio Communication Equipment Sales Office. When ordering a part, be sure to give:

1. G-E Part Number for component
2. Description of part
3. Model number of equipment
4. Revision letter stamped on unit

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, contact the nearest Radio Communication Equipment Sales Office of the General Electric Company.

MAINTENANCE MANUAL

LBI-3491

DF-10008

Progress Is Our Most Important Product

GENERAL ELECTRIC

COMMUNICATION PRODUCTS DEPARTMENT LYNCHBURG, VIRGINIA

(In Canada, Canadian General Electric Company, Ltd., 830 Lansdowne Rd., Toronto, Ontario)

PRINTED IN U.S.A.